Stoller
Grand Junction Office established 1959

299-E28-65 (A6816)
Log Data Report

Borehole Information:

Borehole: 299-E28-65 (A6816)			**Site:** 216-B-12 Crib		
Coordinates (WA State Plane)		**GWL (ft)[1]:** Not reached		**GWL Date:** N/A[2]	
North	**East**	**Drill Date**	**TOC[3] Elevation**	**Total Depth (ft)**	**Type**
136,600.47 m	573,127.56 m	Feb. 1951	227.655 m	81.6	Unknown

Casing Information:

Casing Type	Stickup (ft)	Outer Diameter (in.)	Inside Diameter (in.)	Thickness (in.)	Top (ft)	Bottom (ft)
Threaded Steel	0	8 5/8	8	0.3125	-0.5	81
The logging engineer measured the casing stickup using a steel tape. A caliper was used to determine the outside casing diameter. The caliper and inside casing diameter were measured using a steel tape, and measurements were rounded to the nearest 1/16 in. Casing thickness was calculated. Casing bottom is estimated.						

Borehole Notes:

Borehole coordinates, elevation, and well construction information, as shown in the above tables, are from measurements by Stoller field personnel and HWIS[4]. Zero reference is the top of the 8-in. casing. A 2-ft-deep excavation surrounds the casing. A 55-gallon barrel that has covered this borehole in the past was excavated so logging could take place. This excavation left behind a shallow pit. The borehole swab indicated possible radon.

Logging Equipment Information:

Logging System:	Gamma 1G		**Type:** 35% HPGe
Calibration Date:	03/2003	**Calibration Reference:**	GJO-2003-438-TAC
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Logging System:	Gamma 1C		**Type:** High Rate Detector
Calibration Date:	02/07/02	**Calibration Reference:**	GJO-2002-309-TAR
		Logging Procedure:	MAC-HGLP 1.6.5, Rev. 0

Spectral Gamma Logging System (SGLS) Log Run Information:

Log Run	1	2	3	4/Repeat	
Date	5/7/03	5/7/03	5/7/03	5/7/03	
Logging Engineer	Kos	Kos	Kos	Kos	
Start Depth (ft)	81.0	67.0	32.0	27.0	
Finish Depth (ft)	68.0	31.0	2.0	19.0	
Count Time (sec)	100	15	100	100	

Log Run	1	2	3	4/Repeat	
Live/Real	R	R	R	R	
Shield (Y/N)	N	N	N	N	
MSA Interval (ft)	1.0	2.0	1.0	1.0	
ft/min	N/A	N/A	N/A	N/A	
Pre-Verification	AG007CAB	AG007CAB	AG007CAB	AG007CAB	
Start File	AG008000	AG008014	AG008033	AG008064	
Finish File	AG008013	AG008032	AG008063	AG008072	
Post-Verification	AG008CAA	AG008CAA	AG008CAA	AG008CAA	
Depth Return Error (in.)	N/A	N/A	0	0	
Comments	No fine-gain adjustment.	High dead-time interval.	No fine-gain adjustment.		

High Rate Logging System (HRLS) Log Run Information:

Log Run	1	2	3	4/Repeat	
Date	5/15/03	5/15/03	5/15/03	5/15/03	
Logging Engineer	Kos	Kos	Kos	Kos	
Start Depth (ft)	75.0	71.0	36.0	31.0	
Finish Depth (ft)	70.0	30.0	32.0	30.0	
Count Time (sec)	300 s	100 s	100 s	300 s	
Live/Real	R	R	R	R	
Shield (Y/N)	None	None	None	None	
MSA Interval (ft)	1.0	1.0	1.0	1.0	
ft/min	N/A	N/A	N/A	N/A	
Pre-Verification	AC067CAB	AC067CAB	AC067CAB	AC067CAB	
Start File	AC067000	AC067006	AC067048	AC067053	
Finish File	AC067005	AC067047	AC067052	AC067054	
Post-Verification	AC067CAA	AC067CAA	AC067CAA	AC067CAA	
Depth Return Error (in.)	N/A	N/A	N/A	0	
Comments	No fine-gain adjustment.	No fine-gain adjustment.	Repeat section.	No fine-gain adjustment.	

Logging Operation Notes:

Zero reference was top of the 8-in. casing. Logging was performed with a centralizer installed on the sonde. Pre- and post-survey verification measurements for the SGLS employed the Amersham KUT (^{40}K, ^{238}U, and ^{232}Th) verifier with serial number 118. Before SGLS logging began, the sonde was moved to total depth then back to the surface one time in an attempt to displace radon gas if it was present. HRLS data were collected using Gamma 1C. Pre- and post-survey verification measurements employed the ^{137}Cs verifier with serial number 1013.

Analysis Notes:

Analyst:	Sobczyk	Date:	5/20/03	Reference:	GJO-HGLP 1.6.3, Rev. 0

SGLS pre-run and post-run verification spectra were collected at the beginning and end of the day and compared to the control limits. The verification spectra were all within the control limits. The peak counts per second (cps) at the 609-keV, 1461-keV, and 2615-keV photopeaks on the post-run verification spectra

as compared to the pre-run verification spectra for each day were between 3.0 percent higher and 2.0 percent lower at the end of the day.

HRLS pre-run and post-run verification spectra were collected at the beginning and end of the day. The spectra were within the acceptance criteria for the field verification of the Gamma 1C logging system (HRLS).

Log spectra were processed in batch mode using APTEC SUPERVISOR to identify individual energy peaks and determine count rates. Post-run verification spectra were used to determine the energy and resolution calibration for processing the data using APTEC SUPERVISOR. Concentrations were calculated in EXCEL (source files: G1GMay03.xls and G1CApr03.xls). Zero reference was the ground surface. The casing configuration was assumed to be one string of 8-in. casing to 81 ft. The casing correction factor was calculated using a 8-in. casing thickness of 0.3125 in. This casing thickness is based upon the field measurement. Water corrections were not needed or applied to the data.

Using the SGLS, dead time greater than 40 percent was encountered in the interval from 31 to 74 ft, and data from this region were considered unreliable. At SGLS dead time greater than 40 percent, peak spreading and pulse pile-up effects may result in underestimation of activities. This effect is not entirely corrected by the dead time correction, and the extent of error increases with increasing dead time. SGLS dead time corrections were applied when dead time surpassed 10.5 percent. The HRLS was utilized to obtain data where the SGLS dead time exceeded 40 percent.

Log Plot Notes:

Separate log plots are provided for gross gamma and dead time, naturally occurring radionuclides (^{40}K, ^{238}U, and ^{232}Th), and man-made radionuclides. Plots of the repeat logs versus the original logs are included. For each radionuclide, the energy value of the spectral peak used for quantification is indicated. Unless otherwise noted, all radionuclides are plotted in picocuries per gram (pCi/g). The open circles indicate the minimum detectable level (MDL) for each radionuclide. Error bars on each plot represent error associated with counting statistics only and do not include errors associated with the inverse efficiency function, dead time correction, or casing correction. These errors are discussed in the calibration report. A combination plot is also included to facilitate correlation. The ^{214}Bi peak at 1764 keV was used to determine the naturally occurring ^{238}U concentrations on the combination plot rather than the ^{214}Bi peak at 609 keV because it exhibited slightly higher net counts per second.

Results and Interpretations:

^{137}Cs, ^{154}Eu, and ^{238}U (based on the 1001-keV photopeak) were the man-made radionuclides detected in this borehole. ^{137}Cs was detected at 2 ft with a concentration of 0.3 pCi/g and in the interval from 6 ft through 81 ft at concentrations ranging from 0.5 pCi/g to 249,000 pCi/g. The maximum concentration of ^{137}Cs was measured at 34 ft. ^{154}Eu was detected in the interval from 28 ft through 31 ft at concentrations ranging from 1 pCi/g to 15 pCi/g. The maximum concentration of ^{154}Eu was measured at 31 ft. It is probable that ^{154}Eu exists in the high activity zone. The MDL for ^{154}Eu increases significantly in this zone. ^{238}U was detected at 81 ft with a concentration of 58 pCi/g. The MDL for ^{238}U at this depth was 27 pCi/g. Confirming peaks at 811 and 766 keV were not apparent.

The plots of the repeat logs demonstrate reasonable repeatability of the HRLS and SGLS data. ^{137}Cs (662-keV) concentrations are comparable between the repeat and original HRLS log runs. ^{137}Cs and the natural radionuclides at energy levels of 662, 609, 1461, 1764, and 2614 keV are comparable between the repeat and original SGLS log runs.

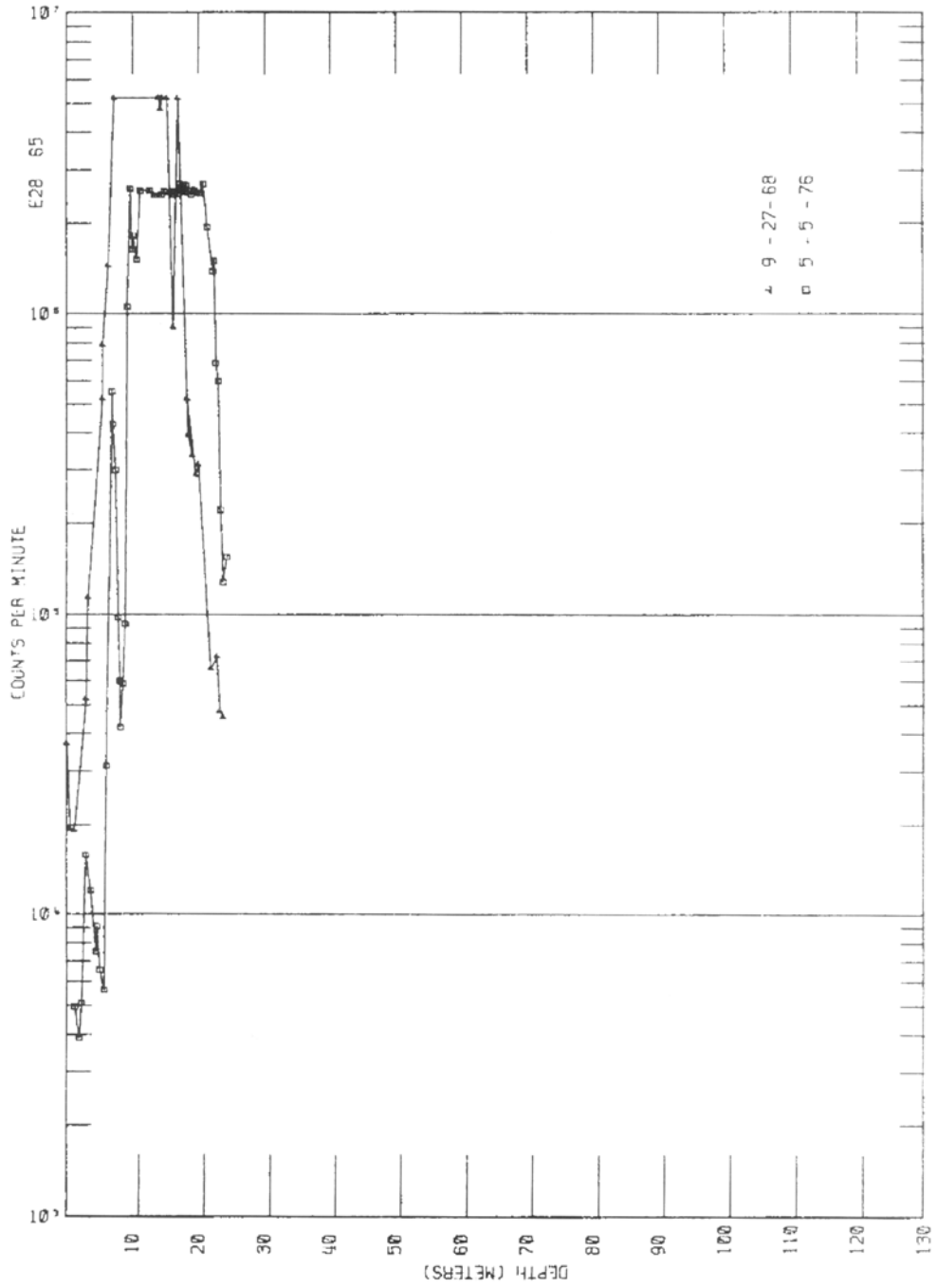
Gross gamma logs from Fecht et al. (1977) (attached) indicate that the sediments surrounding this borehole contained significant amounts of man-made gamma radiation from 1968 through at least 1976. The logs from 9/27/68 and 5/5/76 appear to detect relatively high gamma activity over the entire length of the borehole.

References:

Fecht, K.R., G.V. Last, and K.R. Price, 1977. *Evaluation of Scintillation Probe Profiles from 200 Area Crib Monitoring Wells*, ARH-ST-156, Atlantic Richfield Hanford Company, Richland, Washington.

---

[1] GWL – groundwater level
[2] N/A – not applicable
[3] TOC – top of casing
[4] HWIS – Hanford Well Information System

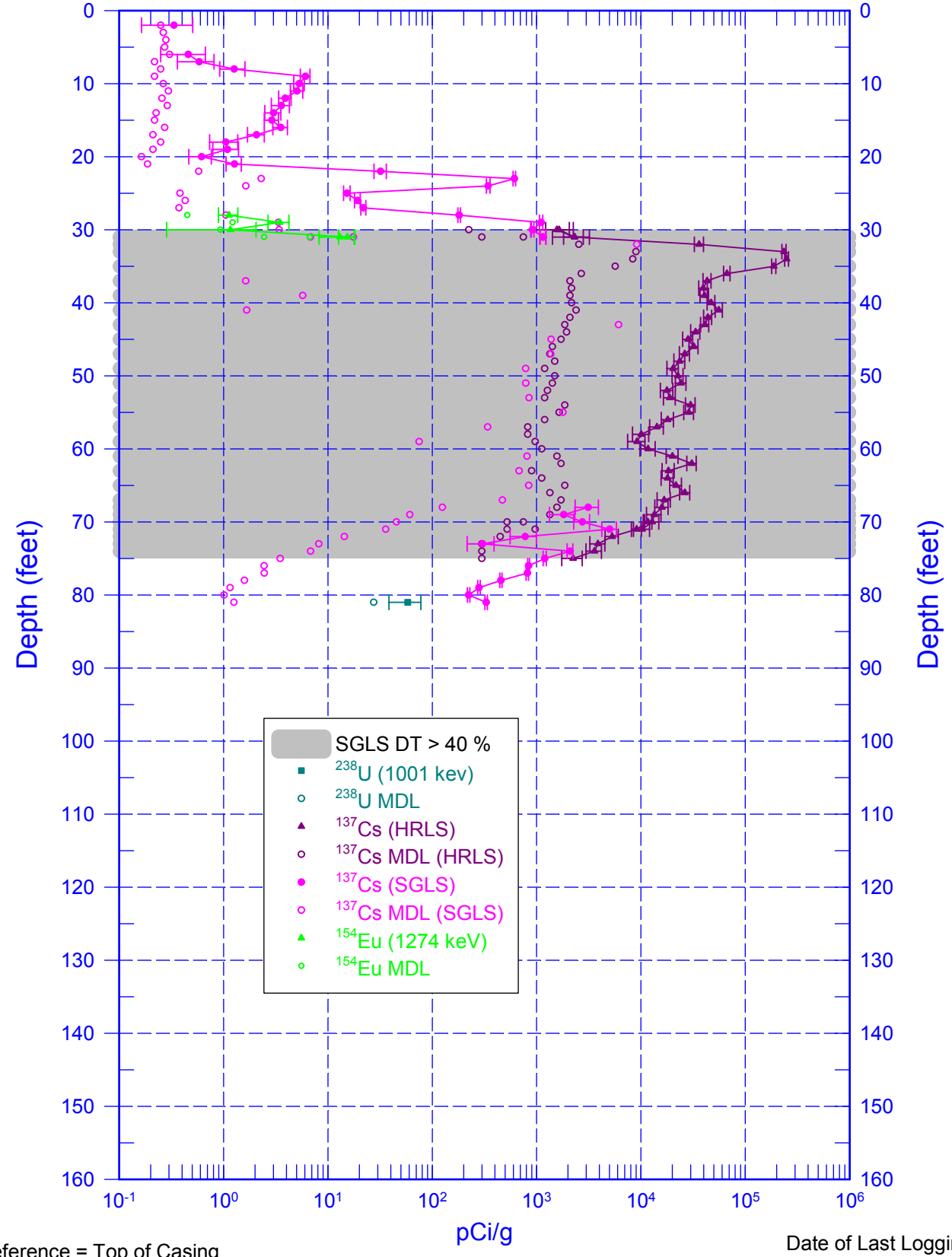


from Fecht et al. (1977)

Scintillation Probe Profiles for Borehole 299-E28-65, Logged on 9/27/68 and 5/5/76

299-E28-65 (A6816)

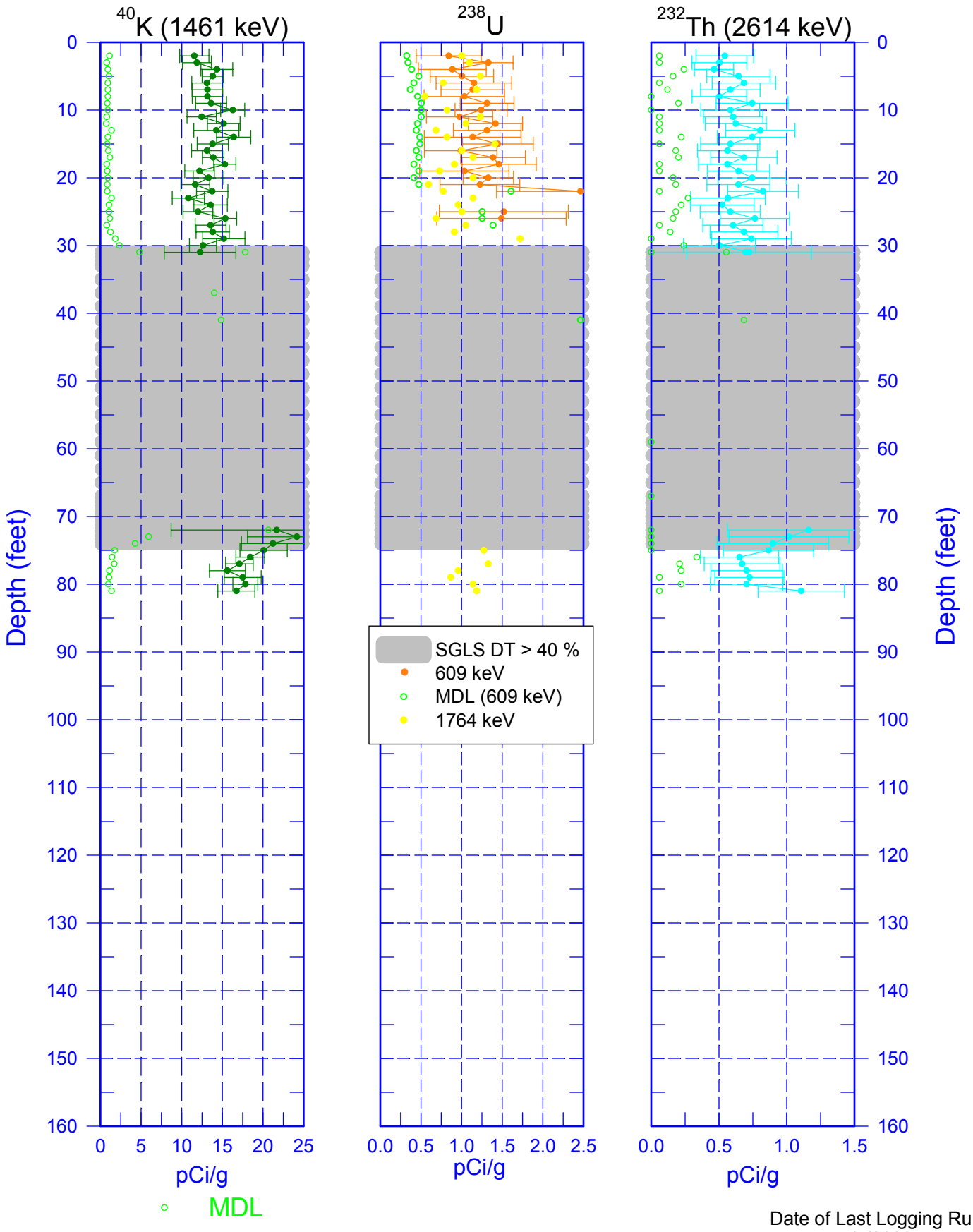
Man-Made Radionuclides



Zero Reference = Top of Casing

Date of Last Logging Run
5/15/2003

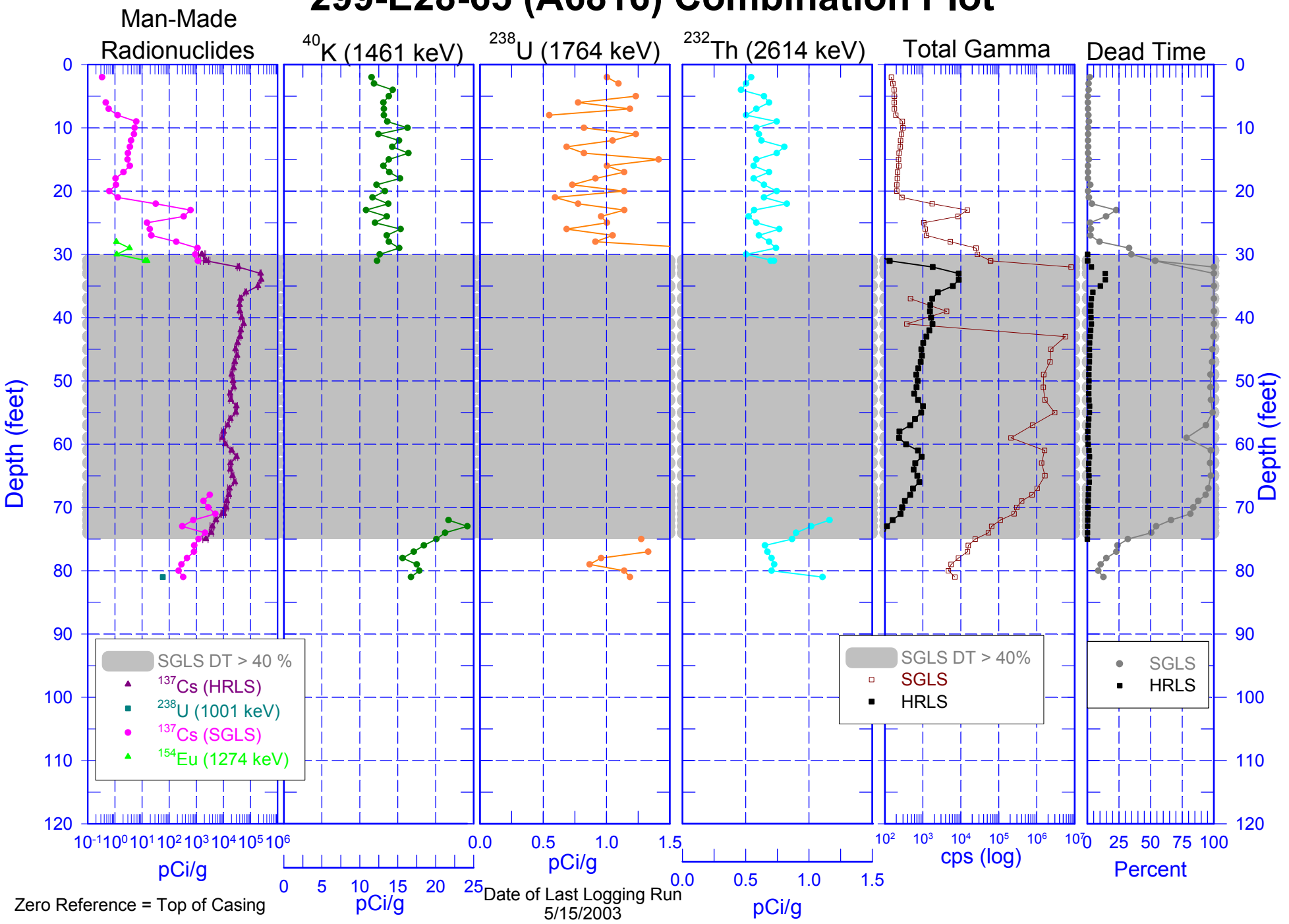
299-E28-65 (A6816)
Natural Gamma Logs



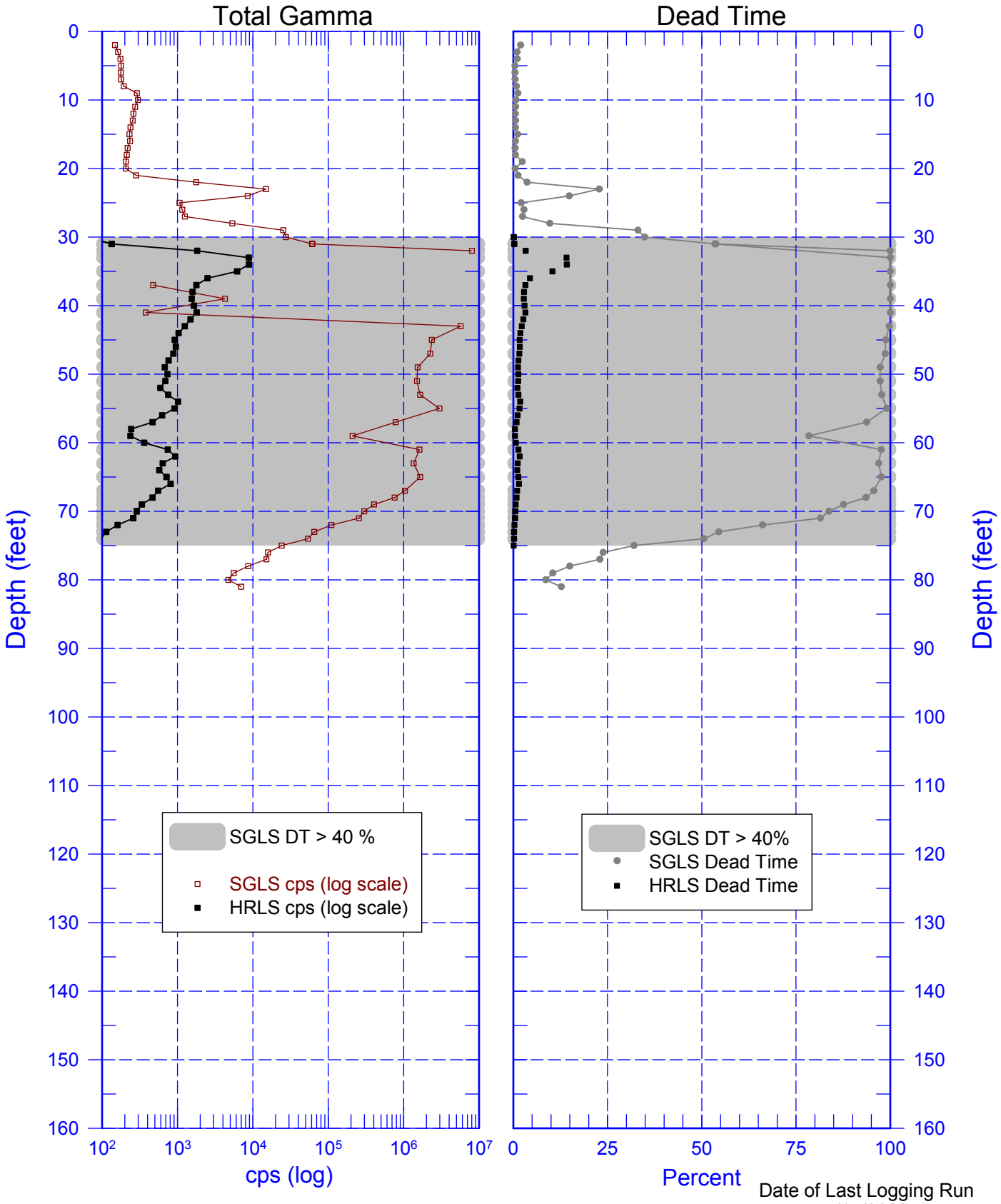
Zero Reference = Top of Casing

Date of Last Logging Run
5/7/2003

299-E28-65 (A6816) Combination Plot



299-E28-65 (A6816)
Total Gamma & Dead Time

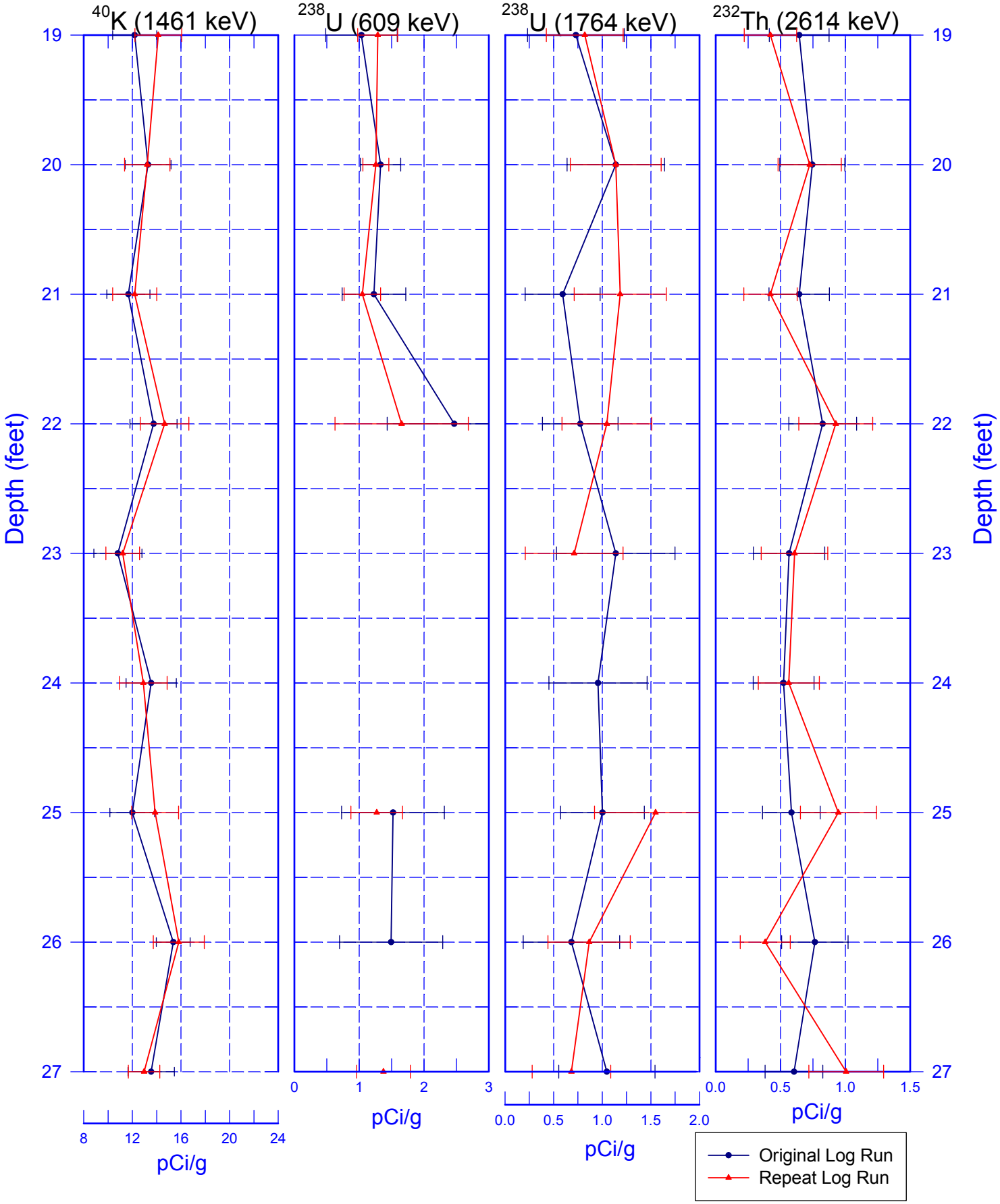


Date of Last Logging Run
5/15/2003

Zero Reference = Top of Casing

299-E28-65 (A6816)

Rerun of Natural Gamma Logs (27.0 to 19.0 ft)



299-E28-65 (A6816)

Rerun of Man-Made Radionuclides